

Case study: The Egyptian Refining Company project in Cairo

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1. Introduction

Egypt has made advances in fuel quality over the past decade by introducing unleaded gasoline, but like many countries in Africa still supplies diesel with very high sulfur content, up to 10,000 ppm or higher. Starting in 2017, Egypt will be improving the quality of its fuel mix and reducing imports of refined diesel with the Egyptian Refining Company (ERC) project in Cairo. The ERC refinery, currently in the early phases of construction, is scheduled to begin production in 2017. ERC's refinery will process low-quality residual fuel oil from the older Cairo Oil Refining Company (CORC) into higher-value products, including 2.3 million tons per year of 10ppm diesel. The ERC has successfully attracted equity and debt financing from a number of international investors and banks, including the World Bank's International Finance Corporation and other development banks.

2. Fuel quality regulations and history

Much of the diesel and gasoline consumed in Egypt is supplied by refineries within the country, which have a total capacity to refine around 730,000 barrels of oil per day (Oil & Gas Journal, 2012) producing about 40,000 barrels of diesel per day (ICCT estimate)¹. Egypt imports about 70% of its diesel (Financial Times, 2013), on the order of 90,000 barrels per day.² Information on the actual quality of fuel supplied does not appear to be reported by the Egyptian Environmental Affairs Agency or readily available through other sources. Egypt has recently experienced diesel shortages, with bus and truck drivers waiting hours in line at fueling stations

¹ Calculated from the ERC refinery's expected diesel output of 2.255 million tons of diesel per year, expected diesel import displacement of 50% (Citadel Capital, 2012), and estimate that 70% of Egypt's diesel consumed in the country is imported (Financial Times, 2013).

² Calculated from the ERC refinery's expected diesel output and import displacement as above.

(Crude Oil Peak, 2013). In this context, increased supply of domestically refined diesel could potentially have positive economic benefits.

The Egyptian Environmental Affairs Agency, within the Ministry of State for Environmental Affairs, is the main agency responsible for fuel quality regulations and coordinates with the Ministry of Petroleum. Egypt regulates the quality of gasoline in the country at about 500 ppm sulfur (International Fuel Quality Data Center and Hart Energy, 2009, as quoted by Asian Clean Fuels Association, 2010) and has made significant progress in switching from leaded gasoline to unleaded; 95% of the country's gasoline is now unleaded (Egyptian Environmental Affairs Agency, 2009). The Egyptian Government's current main strategy to address poor urban air quality is to encourage a broad transition to vehicles operating on compressed natural gas (CNG) for city vehicles, and through financial incentives for taxis and private car owners. The government is also introducing a ban on high-polluting two-stroke motorcycles (Egyptian Environmental Affairs Agency, 2010).

Egypt does not regulate the sulfur content of diesel, and the actual sulfur content of diesel supplied in the country is not well documented and may reach 10,000 ppm, although 5,000 ppm diesel may be available (USEPA, 2012). The Egyptian Environmental Affairs Agency's future plans to reduce vehicle emissions include a goal to "work on improving quality of diesel fuel used in Egypt and reach its content of sulfur to 2% [sic]" (Egyptian Environmental Affairs Agency, 2010). This goal of 2% sulfur equates to 20,000 ppm which does not appear to be an improvement on the status quo. Nonetheless, reducing diesel sulfur content appears to be on the agenda in Egypt.

3. Refinery capacity overview

Egypt has nine refineries in five locations around the nation and these facilities are aging: Only three of the nine

have been constructed since 1973 and the second-largest facility was built in 1913 (Citadel Capital, 2012).

There is one major initiative that will increase the flow of low sulfur fuel in Egypt: a new facility planned by the Egyptian Refining Company (ERC). The ERC was incorporated in July, 2007, and its refinery will be a major upgrade to the existing Cairo Oil Refinery Company (CORC). CORC is the nation's largest refinery, located near Cairo. It has been in operation since 1969 and is relatively inefficient in terms of producing diesel and gasoline: 67% of its output is fuel oil. The ERC refinery will take straight run atmospheric residue from CORC—this is essentially low quality fuel oil that CORC does not have capacity to upgrade—and refine it into diesel and other higher-value products. The total expected production of the ERC refinery will be about 4.5 million tons of refined products and byproducts per year. Of this, 2,255 million tons will be Euro V diesel, 599 thousand tons jet fuel, 522 tons reformate (a blending component of gasoline), 336 tons naphtha, 315 tons fuel oil, and 79 tons LPG annually. The refinery is also expected to produce 453 tons of coke and 96 tons of sulfur as byproducts of the refining process. The refinery will have a hydrocracker (capacity of 40,800 barrels per day, with hydrogen produced onsite), delayed coker (25,000 bpd), diesel hydrotreater (32,100 bpd) and naphtha hydrotreater (22,600 bpd) (Citadel Capital, 2012; GS E&C).

4. Refinery project overview

While the ERC project has been developed in close cooperation with the Egyptian Government, the initial impetus for the project came from the private sector (Citadel Capital). The opportunity for developing the ERC project comes from the large local supply of low-cost fuel oil feedstock, and the context of Egypt's increasing demand for diesel and dependence on diesel imports, which has enabled Government support. While there are environmental side benefits, primarily producing ultra-low sulfur diesel at 10 ppm (Citadel Capital, 2012; Egyptian Refining Company, 2011), fuel desulfurization is not seen as a primary driver of the project. The capacity being built for the ERC project consists entirely of complex refining units able to upgrade fuel oil. These units generally have the highest operating margins (IEA, 2014). By separating high-margin complex refinery units (coker, hydrocracker etc.) from the lower-margin simple refinery units operated by CORC, the ERC project is able to offer better returns to investors than would be possible if building entirely new refinery capacity including atmospheric distillation.

The Egyptian Petroleum Corporation (EGPC) will blend clean fuel produced at ERC with lower quality fuel from other refineries, which will improve the overall quality of the fuel mix in Cairo. The opportunity to deliver improved local air quality through improved fuel quality was one

driver of the decision to produce Euro V fuel (Tom Thomason, personal correspondence).

ERC has the backing of the EGPC, a state-owned entity that administers the industry under the Ministry of Petroleum. All feedstock utilized by the ERC refinery will be provided by CORC, and EGPC will purchase all refined products. Coke and sulfur, byproducts of the refining process, will be sold on the open market. The facility will also produce reformate and naphtha which EGPC will blend into existing stocks to increase the quality of other products, primarily gasoline (Citadel Capital, 2012). Initial work on site preparation began in July 2012, and the project manager, is currently mobilizing subcontractors to start construction. Operations are scheduled to begin in early 2017 and continue for 25 years (Egyptian Refining Company, 2011; Oil & Gas Journal, 2014).

5. Refinery financing

ERC was incorporated in 2007 for the sole purpose of constructing and operating this refinery. The company is owned 82% by Orient Investment Properties Limited, 15% by EGPC, and 3% by other investors (IFC, 2014).

At a total expected cost of 3.7 billion USD, ERC's refinery is financed by a number of international investors and development banks. \$1.1 billion in equity was provided by EGPC, Qatar Petroleum International (QPI), Citadel Capital (owns 11.7% of the project), the World Bank affiliated IFC (3% share), the Dutch and German development banks FMO and DEG, InfraMed Fund, and investors from Egypt and Gulf Cooperation Council countries (Citadel Capital, 2012; IFC). The remaining \$2.6 billion needed for the project was secured in a debt package provided by a number of private and development banks, including: Japan Bank for International Cooperation and Nippon Export and Investment Insurance (JBIC and NEXI, providing 0.9 billion USD combined), Export-Import Bank of Korea (KEXIM, providing 0.8 billion USD), European Investment Bank (EIB, providing 0.5 billion USD), African Development Bank (AfDB, providing 0.2 billion USD), with the remainder of debt provided by Mitsui & Co, Bank of Tokyo-Mitsubishi, HSBC, Calyon Credit Agricole, and CIB (Citadel Capital, 2012; Korea Investment & Securities Co., Ltd, 2012). \$2.35 billion of this debt package is senior debt, or debt for which the lenders have priority in repayment, and \$225 million is subordinated debt, for which lenders do not have priority in repayment (Citadel Capital, 2012; Egyptian Refining Company, 2011). This major debt package was completed in August, 2010 (Citadel Capital, 2010).

The project's developers took several measures to improve the environmental footprint of the refinery in order to facilitate financing with international

institutions such as the European Investment Bank. The decision to produce Euro V fuel was made partly for this reason. As another example, CORC will switch to using natural gas in its on-site operations that had previously burned high sulfur fuel oil, one of a handful of measures that will improve local air quality (Tom Thomason, personal correspondence).

ERC will sell diesel to EGPC at a 1% discount on market prices for ultra low sulfur diesel. This discount, combined with savings to the Government due to lower transportation costs and with various fees paid by the ERC, will deliver approximately \$300 million savings annually for the Egyptian Government (Citadel Capital, 2012; Tom Thomason, personal correspondence). Note that while this arrangement will deliver savings to the Egyptian Government as compared to importing the equivalent volume of fuel, the Egyptian Government currently subsidizes fuel by buying and selling petroleum at below international market prices (African Economic Outlook, 2013), while ERC will be allowed to sell its products to EGPC at market price (Citadel Capital, 2012). This context is starting to change, and the Egyptian Government recently reduced the subsidies for liquid fuel and natural gas, increasing fuel prices at the pump by more than 70% (Reuters, 2014).

6. Barriers/opportunities to low sulfur fuel adoption

The development of the ERC project has withstood a global financial recession (starting in 2008) as well as a revolution (2011) and ongoing political crisis. In particular, there were concerns about the validity of the Egyptian Government's guarantee status for lenders following the 2011 revolution (Credit Suisse, 2012). These financial concerns contributed to delaying the ERC from securing financing for a number of years (Korea Investment & Securities Co., Ltd, 2012), resulting in a delay in construction from an original schedule of 2007-2011 to 2014-2017 (Oil & Gas Journal, 2014).

ERC's facility will produce fuel at the EURO V standard, far cleaner than other fuel available in the country, and the output of this refinery could supply 35% of Egypt's current diesel demand.³ This high contribution of ultra-low sulfur diesel could potentially allow the Egyptian Environmental Affairs Agency to begin mandating diesel fuel quality standards in the future. One pathway could be to first implement a low sulfur diesel standard for Cairo alone, paving the way for a later nation-wide standard. This would follow the examples

³ Calculated from the ERC facility's expected diesel import displacement of 50% (Citadel Capital, 2012), and estimate that 70% of Egypt's diesel consumed in the country is imported (Financial Times, 2013).

of Beijing, where the city government secured mainland China's first supply of 50 ppm and later 10 ppm sulfur diesel, later followed by national commitments to follow these standards (Transportpolicy.net, 2014), and Bogota, which spearheaded the adoption of 50 ppm sulfur diesel for the city's bus fleet, which has been followed by a 50 ppm nationwide standard for Colombia (UNEP, 2012; Minambiente, 2014).

7. Conclusions and lessons learned

The ERC project suggests a pathway towards fuel desulfurization for countries with existing low-complexity refinery capacity, but which are not producing low-sulfur fuels. Complex, high-conversion refinery units (such as cokers and hydrocrackers) deliver better margins than simple refinery units such as atmospheric distillation. By creating in ERC a separate financial entity operating only the high-margin part of the refinery business, financing was made much more viable. Upgrading high-sulfur fuel oil to diesel and other higher-value products allows the quality of road fuel to be improved while reducing industrial emissions.

This project demonstrates that major refinery upgrades can make economic sense at a national level, even ignoring environmental benefits, if they allow the production of more valuable fuel and alleviate import dependence (and reduce the risk domestic fuel shortages in this case). ERC also demonstrates that with a solid and environmentally responsible plan, it is possible to attract sufficient financing through a combination of different types of financial institutions.

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